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## Validating a model of effective teaching behaviour of pre-service teachers

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### ABSTRACT

Although effective teaching behaviour is central for pupil outcomes, the extent to which pre-service teachers behave effectively in the classroom and how their behaviour relates to pupils' engagement remain unanswered. The present study aims to validate a theoretical model linking effective pre-service teaching behaviour and pupil's engagement, incorporating the role of context and teacher characteristics. The study included a sample of 264 pre-service teachers from 64 secondary schools throughout the Netherlands. Pre-service teachers were observed using the International Comparative Analysis of Learning and Teaching to measure effective teaching behaviour and pupils' engagement. We used multilevel modelling to account for the hierarchical structure in the data. Results show that the quality of teaching behaviour of pre-service teachers is below that of experienced teachers. Class size and (partly) teacher gender explain differences in the quality of teaching behaviour. All domains of teaching behaviour are related to pupil engagement, with classroom management and clarity of instruction showing the strongest relationships with academic engagement compared to the other domains. The results make it plausible to approximate minimum standards for the assessment of pre-service teachers based upon a normative criterion based on the impact on pupils' academic engagement.

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academic engagement;  
pre-service teachers

## Introduction

It has been, and still is, a global educational effectiveness goal to explore what works for pupils and how to better improve classroom practices to achieve this. Over decades, international studies have shown that classroom factors play a more important role than school factors in explaining variation on pupils' cognitive and affective outcomes (Kyriakides, Creemers, & Antoniou, 2009; Teddlie & Reynolds, 2000). Effective teacher behaviour, which refers to teachers' behaviour affecting pupils' learning and outcomes (Creemers, 1994; Sammons, Hillman, & Mortimore, 1995), has been shown to be a major element determining pupils' success at school.

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To date, research has revealed various domains of effective teaching behaviour that matter for pupils' academic outcomes. Many past empirical studies focus on specific domains of behaviour, rather than on all the domains in concert. Some domains mentioned in the existing literature include pedagogical knowledge and teacher–student relationships (Beishuizen, Hof, Van Putten, Bouwmeester, & Asscher, 2001; Maulana, Opdenakker, Stroet, & Bosker, 2013), methods of instruction, clarity of instruction and assisting students to achieve deep learning (Kottler, Zehm, & Kottler, 2005), classroom management, methods of teaching, enthusiasm for teaching (Witcher, Onwuegbuzie, & Minor, 2001), professional characteristics, teaching skills and classroom climate (McBer, 2000). Research incorporating a collection of more wide-ranging evidence-based domains of effective teaching behaviour is rather scarce. Undoubtedly, the body of knowledge will benefit from research integrating more widespread domains of teaching behaviour in combination with the evaluation of the influence on pupils' outcomes. Identifying the most salient behavioural domains for pre-service teachers is important for setting a standard in teacher education. Pre-service teachers cannot be expected to teach at the level of experienced teachers. By setting standards, the influence of interventions aiming to accelerate the growth in level of teaching behaviour can be made visible, too. Furthermore, past research indicated that several personal (i.e. gender) and contextual characteristics (i.e. teaching subject) explain differences in effective teacher behaviour (Maulana, Opdenakker, Stroet, & Bosker, 2012, 2013; Opdenakker, Maulana, & den Brok, 2012). However, it is inconclusive whether influences of personal and contextual characteristics are visible in all teaching domains and whether these factors are visible in pre-service teachers' behaviour too.

Studies revealed that effective teaching behaviour has a powerful effect on pupils' academic engagement (e.g. Davidson, Gest, & Welsh, 2010; Goodenow, 1993; Maulana et al., 2012; Opdenakker et al., 2012). Academic engagement refers to engaged behaviour (effort exertion and persistence, mental effort indicators, attention and concentration) and engaged emotion (enjoyment and enthusiasm) in academic tasks (Skinner, Kinderman, & Furrer, 2009). Nevertheless, the knowledge about the relation between effective teaching behaviour and pupils' engagement in the context of pre-service teachers' teaching practices is limited. Past research in primary education showed that compared to experienced teachers, pre-service teachers demonstrate the lowest teaching performance levels, followed by beginning teachers (Van de Grift, 2010). Because high levels of teaching behaviour correspond to high levels of pupils' academic outcomes, both in primary and secondary education, it is inconclusive whether or not this finding will be evident in the classroom of pre-service teachers too. Hence, the context of the pre-service teachers' classroom offers an important setting for the identification and improvement areas of effective teaching behaviour influencing pupils' academic engagement.

The present study aims to validate a theoretical model linking effective pre-service teaching behaviour, of different domains in concert, to pupils' engagement, incorporating the role of context and teacher characteristics.

## **Theoretical frameworks: bringing evidence together**

### ***Effective teaching behaviour***

Over decades, researchers have been investigating the very best teaching practice. Various terms have been used to describe the best teaching practice including 'highly qualified' teaching (Darling-Hammond & Youngs, 2002), 'excellent' teaching (Chen, Brown, Hattie,

& Millward, 2012), ‘good’ teaching (Watkins & Zhang, 2006), ‘effective’ teaching (Creemers, 1994) and ‘good and effective’ teaching (Van de Grift, 2007). Although the variation in terminology is inevitable, all of the studies address a similar set of the best teaching practice components. In the present study, we use the term *effective teaching* throughout the article for consistency.

In the present study, we focus our investigation on visible teaching behaviours in the classroom setting based on evidence gathered by Kyriakides et al. (2009) in their research on effective education as well as the meta-analysis of Hattie (2009). In general, teaching behaviour can be defined as effective when it has a significant influence on student outcomes such as academic engagement (Maulana et al., 2012; Opdenakker et al., 2012) and academic achievement (Creemers, 1994; Sammons et al., 1995; Scheerens, 1992; Van de Grift, 2007). Particularly, reviews of educational research reveal the following observable evidence-based teaching behaviours to be encountered in any lesson: creating a safe and stimulating learning climate, efficient classroom management, providing clear instruction, activating learning, adaptive teaching and teaching learning strategies (Cotton, 1995; Ellis & Worthington, 1994; Hattie, 2009; Levine & Lezotte, 1995; Marzano, 2003; Sammons et al., 1995; Scheerens & Bosker, 1997; Walberg & Haertel, 1992). Each domain of teaching behaviour is described below.

### ***Safe and stimulating learning climate***

Good learning climates are safe and stimulating for pupils to learn. Effective teaching behaviour associated with conducive and productive learning climates includes creating a relaxing learning atmosphere, showing respect to pupils and ensuring that pupils respect the teacher and their peers, encouraging self-confidence of pupils and facilitating good teacher–pupil (interpersonal) relationships (Cornelius-White, 2007; Hattie & Clinton, 2008; Opdenakker et al., 2012; Smith, Baker, Hattie, & Bond, 2008; Teodorović, 2011; Willms & Somer, 2001).

### ***Efficient classroom management***

Classroom management is an important domain of effective teaching behaviour. Research showed that efficient classroom management is an important predictor of pupils’ learning and outcomes (Carnine, Dixon, & Silbert, 1998; Houtveen, Booij, de Jong, & Van de Grift, 1999; Maulana et al., 2012; Scheerens & Bosker, 1997). Several indicators of teachers’ behaviour associated with efficient classroom management include ensuring that the lesson begins and ends on time, managing lesson transition efficiently, minimising time for task-unrelated matters, dealing with pupils’ misbehaviour efficiently, preparing the lesson well and displaying good lesson structure (Creemers, 1994; Marzano, 2003; Opdenakker & Minnaert, 2011; Wang, Reynolds, & Walberg, 1995; Yair, 2000).

### ***Clarity of instruction***

Pupils will not learn as much as they can if instructions are unclear. Research originating from behaviourism, constructivism and direct instruction paradigms showed that instructional clarity is related to pupils’ learning performances. Making the lesson objective clear in the beginning of the lesson is important so learners know what is expected to do during the lesson (Hattie & Clinton, 2008; Smith et al., 2008). Furthermore, providing a clear lesson structure and displaying a good interchange of explanations and lesson presentations, managing independent works and dividing individual and group works clearly are important

indicators of instructional clarity as well (Creemers, 1994; Kindsvatter, Wilen, & Ishler, 1988). Additionally, checking that pupils understand the learning material is also important (Kameenui & Carnine, 1998; Pearson & Fielding, 1991; Rosenshine & Meister, 1997).

### *Activating learning*

Research showed that learning tends to be optimised when teachers' behaviour is directed towards the facilitation of active learning. Promoting pupils to learn actively, intensifying instructions and avoiding excessive work seats are related to pupils' learning and outcomes (Hampton & Reiser, 2004; Lang & Kersting, 2007). Moreover, activating pupils' prior knowledge, making use of 'advance organisers' and ensuring that pupils are aware of the relevance of the lesson content are teachers' behaviour related to pupils' learning performances (Nunes & Bryant, 1996; Pressley et al., 1992). A more recent study showed that an activating learning environment is related to the quality of teacher–pupil and peer interactions (Meeuwisse, Severiens, & Born, 2010). If the quality of teacher–pupil interactions improves, pupils' learning and performances tend to improve as well (Maulana et al., 2012; Opdenakker et al., 2012).

### *Adaptive teaching*

Effective teaching requires that teachers recognise the characteristics of learners they teach because pupils with different characteristics (i.e. high versus low ability level) have different learning needs in order to progress. This implies that even within the same learning material, teachers need to adapt their teaching, given various pupil characteristics in their classes. For example, teachers may exhibit traditional lecturing approach to a group of high ability level of pupils, but teachers may need to combine lecturing and modelling strategies together, in a slower pace, when teaching a group of low ability level of pupils to achieve the desired learning outcome. Indeed, past studies showed that adapting teaching to the needs of various pupil characteristics leads to a better learning performance. Several indicators of teaching behaviour associated with adaptive teaching include devoting extra time and additional instructions, pre-teaching and re-teaching and implementing various effective teaching methods (Houtveen et al., 1999; Lundberg & Linnakylä, 1992; Pearson & Fielding, 1991; Sijtsma, 1997).

### *Teaching learning strategies*

In the cognition and information processing literature, the knowledge about metacognitive strategies has been used as a framework to help pupils achieve higher level of learning skills (Carnine et al., 1998). A metacognitive strategy is a heuristic approach facilitating pupils to develop procedures in order to regulate their own learning process. Teachers can help support this via scaffolding. Scaffolding is a form of temporary support provided by teachers (or by peer pupils) that functions as a bridge between pupils' existing and desired skills. This support is considered temporary because teachers provide it only when needed. This implies that pupils may not need the support anymore once they acquire the desired skill, but it can be provided again when they need it (Carnine et al., 1998; Rosenshine & Meister, 1997). The primary goal of scaffolding is to simplify the complexity of problems by explaining problems into a manageable fragment so that students get a real chance to solve them (Bickhard, 1992).

Teachers' behaviour related to the support of scaffolding includes offering simplified problems, modelling, thinking aloud during the solution of problems and using cue cards of checklists. Research showed that teachers who display modelling explicitly, deliver scaffolding and provide corrective feedback contribute significantly to the performance of their pupils (Hattie & Clinton, 2008; Slavin, 1996; Smith et al., 2008).

Importantly, Van de Grift (2007, 2014) demonstrated that the first three effective teaching domains are considered as more basic teaching skills characterised by easier levels of difficulty, while the rest are considered as more complex teaching skills characterised by higher levels of difficulty. He showed that experienced teachers scored high in all the six teaching domains.

### **Contextual factors and teacher characteristics influencing effective teaching behaviour**

Several contextual factors and teacher characteristics have been found to affect effective teaching behaviour in general. No prior study linking effective teacher behaviour to contextual factors and pre-service teacher characteristics are known to the authors. The explorative nature of this study investigates a subset of the possible influences, and should be seen as a starting point in unravelling these influences. In this section, effects of teacher gender, teacher preparation route and class size are discussed. Van de Grift, Van der Wal, and Torenbeek (2011) revealed that female teachers show higher levels of effective teaching behaviour in the classroom in the primary school setting. Similarly, Martin and Yin (1997) showed that female teachers are less controlling compared to male teachers. However, Van Petegem, Creemers, Rossel, and Aelterman (2005) demonstrated that leadership and being friendly are more related to male teachers than to female teachers. Consistent with this, Opdenakker and Van Damme (2007) also found that classroom organisation is better in male teacher classrooms than in female teacher classrooms. Likewise, Opdenakker et al. (2012) revealed that female teachers are less friendly compared to male teachers.

Furthermore, research on the effects of teacher preparation routes on effective teaching behaviour is scarce. Unfortunately, the definitions of preparation routes differ from country to country making comparisons between countries problematic. The literature of research concerning teacher preparation routes in the USA, for instance, focuses on the distinction between traditional versus alternative preparation routes. The traditional routes constitute (a) sub-degree certificate or diploma programmes in colleges, usually for elementary teachers that emphasise pedagogical preparation to a greater extent compared to subject area preparation; (b) bachelor's degree programmes, usually three to four years in length, with greater emphasis on subject matter and relatively less on pedagogy; and (c) master's degree and/or fifth-year programmes of one to two years' duration designed for graduates with a bachelor's degree who receive a master's degree or postgraduate diploma. The alternative route refers to emergency certification for immediate employment, school-centred initial teacher training and employment-based teacher training for non-qualified serving teachers; and specialised teacher recruitment programmes such as Teach for America in the USA and Teach First in England (Lai & Grossman, 2008).

In the USA, the *traditional* preparation route requires teachers to complete all their certification requirements before beginning to teach. In recent years, as many as a third of new hires have begun teaching before completing all their certification requirements



(alternative route) (Institute of Education Sciences, 2009). *Alternative* routes have grown in number and size in response to teacher shortages and the No Child Left Behind Act of 2001, which requires that every core class be staffed with a teacher who is certified or enrolled and making adequate progress towards certification through an approved programme. Our research includes the school-based route which includes the so-called alternative (emergency) route. The Dutch school-based route is a joint teacher preparation effort of teacher education institutes with schools-based educators.

Boyd, Grossman, Lankford, Loeb, and Wyckoff (2008) studied the added value of preparation routes to pupil achievement in primary education. They illuminate that some routes appear to be stronger because they attract better teacher candidates. Some programmes seem to be less effective because they provide teachers for the weaker schools. Their study revealed that teacher preparation that focuses more on the work in the classroom and provides opportunities for teachers to study what they will be doing as first-year teachers seems to produce teachers who, on average, are more effective during the first year of teaching.

Last but not least, class size is another contextual factor influencing effective teaching behaviour. Theoretically, smaller classes allow for more effective and flexible teaching and the potential for more effective learning than large classes. Research showed that teaching support and focused (individualised) teaching are more visible in smaller classes than in large classes (Blatchford, Moriarty, Edmonds, & Martin, 2002). In contrast, teacher attention to individual pupils is reduced in large classes (Bennett, 1996), while more interactions between teachers and pupils are more evident in smaller classes (Blatchford, Bassett, & Brown, 2011; Brühwiler & Blatchford, 2011). However, other research demonstrated that the effects of class size reductions on teaching quality are minimal (Ehrenberg, Brewer, Gamoran, & Willms, 2001; Shapson, Wright, Eason, & Fitzgerald, 1980). In the teaching and teacher effectiveness literature, importance of maximising teaching time and instructional support to optimise students' opportunity to learn is highlighted (Creemers, 1994; Maulana et al., 2012; Pellegrini & Blatchford, 2000). Smaller classes show better pupils' academic performance and the effect is most pronounced for pupils who are placed in small classes since their initial schooling period (Finn & Achilles, 1999; Nye, Hedges, & Konstantopoulos, 2000).

### ***Effective teaching behaviour and pupils' academic engagement***

Over decades, researchers and educators have faced the challenge in engaging pupils academically. Academic engagement has become a problem in all levels of education. Particularly, disengagement seems to be the worst during transition periods: as from primary to secondary to higher education (Anderman, 1999; Marks, 2000; McDermott, Mordell, & Stoltzfus, 2001). Academic engagement has been shown to be a significant predictor of pupils' academic achievement and behaviour (Arhar & Kromrey, 1993; Voelkl, 1995). When engaged academically, pupils tend to achieve higher grades and have lower dropout rates (Goodenow, 1993; Roderick & Engel, 2001; Willingham, Pollack, & Lewis, 2002). In contrast, disengagement is a critical inhibitor of academic success. Research showed that low levels of engagement are associated with absenteeism, disruptive behaviour in class and school dropout (Lee, Smith, & Croninger, 1995; Steinberg, Brown, & Dornbusch, 1996).

Studies revealed that effective teaching behaviour has a powerful effect on pupils' academic engagement. Particularly, (pedagogical) caring, classroom managerial and supportive



teacher behaviours are related to pupils' learning engagement (Davidson et al., 2010; Goodenow, 1993; Maulana et al., 2012; Opdenakker et al., 2012; Wentzel, 1997). To sum up, research suggests that effective teaching behaviour has a beneficial influence on engaging pupils academically, which in turn affects pupils' performance to succeed at school.

### **Research aims and hypothesis**

In the present study, we aim to validate a model of effective teaching behaviour of pre-service teachers by examining the general level of effective teaching behaviour of pre-service teachers, by evaluating the role of context factors (school preparation route and classroom characteristics: teaching subject and class size) and teacher characteristics (gender) in explaining differences in teaching behaviour of pre-service teachers, and by investigating the link between pre-service teachers' effective teaching behaviour and pupils' academic engagement.

Based on the literature showing differences in the level of effective teaching behaviour between inexperienced and experienced teachers, we hypothesise that the level of effective teaching behaviour of pre-service teachers will be lower than that of experienced teachers. The practical relevance of this exploration is setting the stage for a realistic standard for pre-service teacher education. Furthermore, based on the literature indicating the role of personal and contextual characteristics, we hypothesise that school preparation route, teaching subject, class size and teacher gender will explain differences in effective teaching behaviour of pre-service teachers. Finally, based on research showing the link between effective teacher behaviour and academic outcomes, we hypothesise that effective teaching behaviour of pre-service teachers will be positively related to pupils' academic engagement.

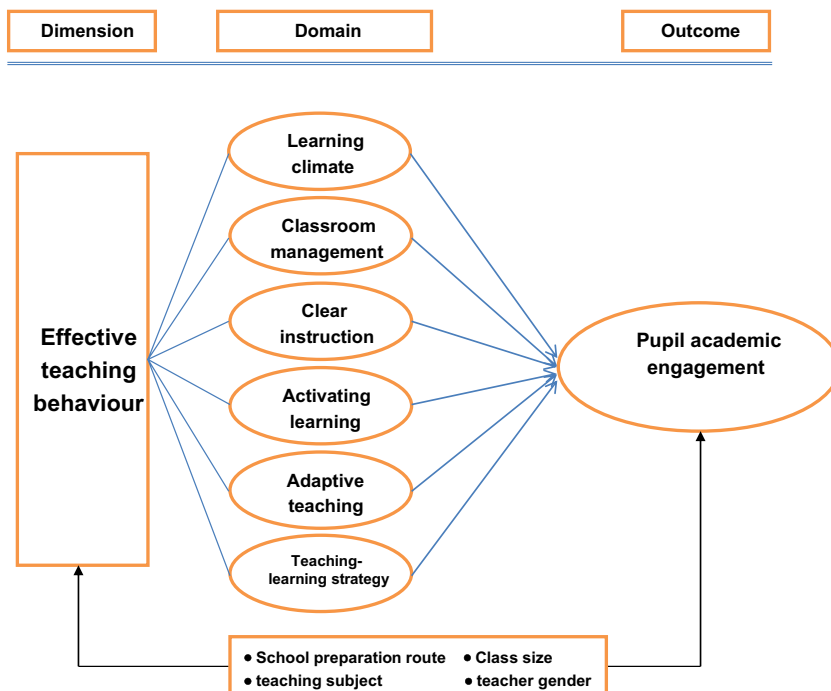
The hypothesised model is presented in Figure 1. The model specifies three elements that include effective teaching behaviour at the dimension level, the six observable evidence-based teaching domains at the domain level and pupils' academic engagement at the outcome level. Additionally, background characteristics that include school preparation route, teaching subject, class size and teacher gender are included.

The merits of the model are in providing a framework for future investigations: (1) to confirm similar influences of contextual and personal characteristics on pre-service teachers' behaviour when compared to that of more experienced teachers and (2) to reveal differential impacts on pre-service teachers' engagement (or other outcomes) when compared to that of more experienced teachers. These insights can lead to (3) more targeted interventions to support the development of pre-service teachers' effective behaviour. Additionally, (4) pre-service teacher assessment procedures can be developed and (5) it can be used as a starting point for the development of induction programmes for certified teachers.

## **Method**

### **Sample and procedure**

The study included a representative national sample of 264 pre-service teachers from 64 secondary schools throughout the Netherlands. Of the schools, 89.7% were an academically oriented type of secondary education and the remaining were vocationally oriented. All schools in the Netherlands were approached ( $N = 650$ ) and pre-service teachers were



**Figure 1.** The hypothesised model of the link between effective teacher behaviour and pupils' academic engagement.

recruited based upon voluntary participation. Of the teachers, 146 were female and 118 were male. All teachers were inexperienced ( $M_{\text{teaching experience}} = 2.45$ ,  $SD = 5.2$ ). About 33% of the teachers taught natural science subjects (i.e. math, biology, physics and/or chemistry) and 67% taught social science and language subjects (i.e. history, philosophy, economy and/or English). Class size varied between 10 and 40 students ( $M = 21.4$ ,  $SD = 5.9$ ). Of the participating schools, 34% were schools following a school-based preparation route (in Dutch: OIDS) and 66% were schools following the traditional preparation route (in Dutch: NOIDS).<sup>1</sup>

## Measures

### Effective teaching behaviour

To examine effective teaching behaviour of pre-service teachers, the observation instrument originally developed for the International Comparative Analysis of Learning and Teaching (ICALT; Van de Grift, 2007) was used. This instrument has been validated for the primary educational setting in previous studies across various different countries including the Netherlands, Belgium, Germany, England, Slovakia and Croatia (Van de Grift & Van der Wal, 2010; Van de Grift et al., 2011). The reliability of the instruments has been shown to be beyond the acceptable level ( $>0.70$ ) (Van de Grift et al., 2011). Furthermore, inspection of reliability using a more advance statistical technique such as multi-group confirmatory factor analysis provides more evidence regarding the robustness of the teaching behaviour measure (Van de Grift, 2014). Evidence of validity from primary education context is also

**Table 1.** Descriptive statistics and correlations between domains of teaching behaviour, personal and contextual characteristics (32 items,  $N = 264$ ).

	1	2	3	4	5	6	7	8	9	10	Cronbach's $\alpha$		M	SD	ICC	Criteria (% of teachers)		Mean inter-scale correlation	
																Insufficient	Sufficient	Good	
1. Learning climate	–										.82	3.36	.54	.52	.8	34.6	64.6		.59
2. Classroom management	.69**	–									.82	3.11	.64	.53	5.3	44.7	50		.65
3. Clear instruction	.67**	.81**	–								.87	3.07	.60	.48	5	46	49		.70
4. Activating learning	.62**	.70**	.81**	–							.83	2.87	.63	.40	6.8	58.6	34.6		.69
5. Adaptive teaching	.48**	.51**	.58**	.66**	–						.82	2.37	.79	.54	27.2	58.5	14.3		.58
6. Teaching learning strategies	.52**	.55**	.67**	.75**	.69**	–					.90	2.62	.77	.59	19.2	53.5	27.3		.63
7. Pupil engagement	.57**	.70**	.65**	.56**	.45**	.47**	–				.89	3.03	.72	–	–	–	–		–
8. Teaching subject <sup>a</sup>	.03	–.01	.06	.07	.04	.07	–.02	–			–	.68	.46	–	–	–	–		–
9. Class size <sup>b</sup>	–.08	–.13*	–.15*	–.14*	–.22**	–.14*	–.17**	.05	–		–	.65	.47	–	–	–	–		–
10. Teacher gender <sup>c</sup>	.10	.03	.13*	.08	.08	.04	–.01	.13*	–.00	–	–	.55	.49	–	–	–	–		–
11. School type <sup>d</sup>	–.13	–.06	–.09	–.12	–.15*	–.16*	–.02	.06	–.00	.01	–	.34	.47	–	–	–	–		–

\* $p < .5$ ; \*\* $p < .01$  (two-tailed).

<sup>a</sup>Teaching subject was coded 0 = mathematics and natural sciences; 1 = social sciences and language.

<sup>b</sup>Class size was coded 0 = small class (10–20 students); 1 = large class (21–40 students).

<sup>c</sup>Teacher gender was coded 0 = male; 1 = female.

<sup>d</sup>School type was coded 0 = NOIDS school; 1 = OIDS school.

visible, showing that the six domains of teaching behaviour are related to pupil engagement and achievement (Van de Grift, 2007). The instrument consists of 32 items measuring 6 domains of evidence-based effective teaching behaviour as described in the literature section, namely: safe and stimulating learning climate (4 items), efficient classroom management (4 items), clear instruction (7 items), activating learning (7 items), adaptation of teaching (4 items) and teaching learning strategies (6 items, see Appendix 1). The behaviour indicators are coded on a four-point Likert scale representing the degree of the observed effective teaching behaviour, ranging from 1 (*predominantly weak*) to 4 (*predominantly strong*). For each high-inference indicator, various low-inference indicators are given in order to establish a factual basis for scoring the high-inference indicators.

In the present sample, reliability scores of the effective teaching behaviour domains ranged from 0.82 to 0.90, indicating that all domains are internally consistent (see Table 1). Intra-class correlations between domains ranged between 0.37 (activating learning) and 0.60 (teaching learning strategy), indicating that a significant amount of variance could be found at the teacher level. This means that the observation domains could distinguish between teacher differences in effective teaching behaviour. Moreover, mean inter-scale correlations ranged from 0.59 (safe and stimulating learning climate) to 0.70 (clear instruction). This indicates that although there was an overlap among effective teaching domains, the scales measured distinct aspects of effective teaching behaviour). High inter-scale correlations suggest a support for the unidimensional construct of effective teaching behaviour.

Furthermore, exploratory factor analysis with oblimin rotation indicated that a six-factor solution could be extracted, which is consistent with the number of hypothesised teaching domains. The six domains accounted for 68% of the variance. The first domain accounted for 42% of the variance, the second for 8%, the third for 6% and the remaining for about 4% each. In addition, correlations between domains of teaching behaviour and academic engagement ranged between 0.45 (Adaptive teaching) and 0.70 (classroom management). This result provides a strong support for the predictive validity of the six teaching behaviour scales. Additionally, Table 1 reveals that more than 92% of pre-service teachers reveal sufficient levels in learning climate, classroom management, clear instruction and activating learning. Sufficient levels of adaptation and Teaching strategies are achieved by 73 and 81%, respectively. A smaller proportion of pre-service teachers achieve high levels of teaching behaviour.

### **Academic engagement**

The measure of observed academic engagement was based on a scale developed by Van de Grift (2007). Observers rated a scale consisting of three items provided on a four-point response, ranging from 1 (*predominantly not engaged*) to 4 (*predominantly engaged*). The conceptualisation of academic engagement used in this study is consistent with that of Maulana et al. (2012), with an emphasis on psychological and behavioural engagement. Examples of items are 'students are engaged during the lesson' and 'students show interest in learning'. The internal consistency of academic engagement scale of the present sample is very good (Cronbach's  $\alpha$ : 0.89).

### **Coding procedure training**

For each school participating in the study, pre-service teachers were observed by trained observers (52% of the observers were female). All trained observers were experienced

(>5 years of experience), certified teachers. All observers were also mentors in schools where pre-service teachers taught. The observers were carefully trained before executing the classroom observations. The training of observers was organised in sessions of 5–12 participants. The trainees received information about the review studies used in the instrument construction and research results. They also studied the item content. In the second part, trainees watched the first video-taped lesson fragment and rated the teacher by means of the observation instrument. The scores were compared and discussed until consensus was reached. The ratings were used to calculate consensus among observers and the ratings were compared to a norm group rating. In the third part, the procedure was repeated, using a different video-taped lesson fragment. For the present study, the interrater reliability is 0.71. Certified observers observed pre-service teachers' teaching practices in the natural classrooms setting. Each pre-service teacher was rated by one observer.

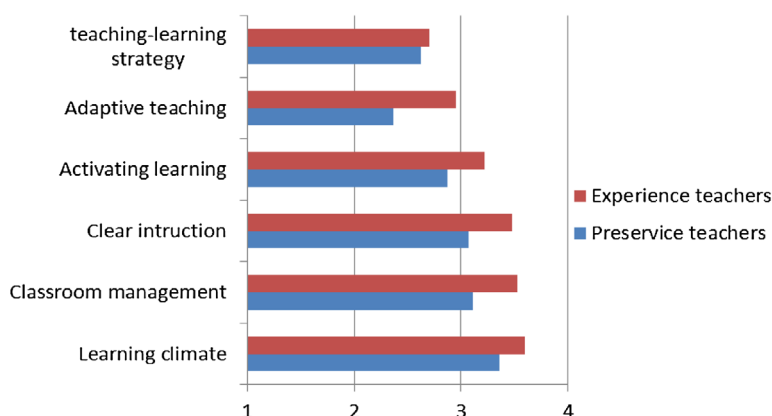
### *School, classroom and teacher characteristics*

Teacher preparation route was examined as a school characteristic. Schools in this study were categorised as either following a school-based route (OIDS) or an institution-based route (NOIDS).<sup>2</sup> The two routes differ in the proportion of influence in the teacher preparation route; the school-based route entails more influence and responsibility of the school in teacher preparation compared to the institution-based route. In both routes, the certification remains the task of the teacher education institution. Two variables of classroom characteristics were included. The first was teaching subject: whether pre-service teachers taught math and natural science subjects or social sciences and language subjects. The second was class size: whether pre-service teachers taught a small class or a large class. Finally, teacher gender was included as a teacher characteristic. All variables were dummy coded for inclusion in multilevel modelling.

### *Analytic strategy*

We conducted descriptive analyses to obtain information about the general level of effective teaching behaviour (Hypothesis 1). Furthermore, we performed multilevel analyses to investigate the role of the preparation route, teaching subject, class size and teacher gender in explaining differences in teaching behaviour of pre-service teachers (Hypothesis 2) and to explore the link between effective teaching behaviour and pupils' academic engagement (Hypothesis 3). Multilevel analysis is an advanced methodology for the analysis of hierarchical or nested data with complex patterns of variability: e.g. students in classes, classes in schools. Multilevel modelling is an extension of the multiple linear regression model to a model that includes nested random effects (Snijders & Bosker, 1999). In this study, two-level models were performed with school as level two and teacher as level one.

Modelling was done in a number of steps. Firstly, the simplest model was performed to estimate the distribution of variance in effective teaching behaviour across levels (empty model). Next, school, classroom and teacher characteristics were included in the model (covariate model). Effects of these variables were examined separately as well as in combination with each other. In the next step, the empty model was calculated for student academic engagement. Then, effects of effective teaching behaviour, controlled for other characteristics, were examined (teaching model). Effects of each domain of teaching behaviour were examined separately as well as in combination with each other. The programme



**Figure 2.** General level of effective teaching behaviour of pre-service teachers (this study) and of experienced teachers (Van de Grift, 2010).

MLwiN was used to perform the multilevel modelling (Rasbash, Charlton, Browne, Healy, & Cameron, 2005).

## Results

### *General level of effective teaching behaviour of pre-service teachers*

Figure 2 illustrates the average score of effective teaching behaviour of pre-service teachers across the six teaching domains. In general, learning climate, classroom management and clear instruction of pre-service teachers are moderately strong (Mean = 3.36, 3.11 and 3.07, SD = .54, .64 and .60, respectively). Furthermore, their levels of activating learning, adaptation and teaching strategies are still moderately weak (Mean = 2.87, 2.37 and 2.62, SD = .63, .79, .77, respectively). This suggests that, on average, pre-service teachers have better teaching performance in the more basic effective teaching behaviour than in the more complex domains. This patterning is also similar with that of experienced teachers. However, in all domains, the level of effective teaching behaviour of pre-service teachers is lower than that of experienced teachers. More particularly, about 1 to 6% of pre-service teachers are still lacking in mastering the three more basic teaching domains (see Table 2). Additionally, about 7 to 28% of the teachers are still below the sufficient level in mastering the more complex teaching domains.

### *Effects of school, classroom and teacher characteristics*

Before examining the role of contextual and personal characteristics, we estimated the distribution of the total variance in teaching behaviour across school and teacher levels to examine which level is important for the characteristic under study (see Table 2). We found that differences in both school and teacher levels associated with teaching behaviour of pre-service teachers are visible for all teaching domains. In general, the variance at teacher level is larger (63–77%) than the variance at school level (23–37%). This suggests that there are large differences between pre-service teachers with respect to all domains of teaching

Table 2. Multilevel models of teaching behaviour (covariate model).

	Learning climate		Classroom management		Clear instruction		Activating learning		Adaptive teaching		Teaching learning strategies	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>												
Intercept	3.34**	.11	3.02***	.14	2.96***	.12	2.86***	.13	2.42***	.15	2.74***	.16
Teaching subject <sup>a</sup>	-.03	.09	.02	.11	.12	.09	.14	.10	.13	.12	.16	.13
Class size <sup>b</sup>	-.12	.08	-.23*	.11	-.26**	.09	-.26**	.10	-.36**	.12	-.35**	.12
Teacher gender <sup>c</sup>	.16*	.08	.12	.10	.18*	.09	.10	.09	.17	.11	-.02	.11
School type <sup>d</sup>	-.17	.09	-.03	.12	-.05	.10	-.13	.11	-.22	.12	-.21	.13
<i>Random effects</i>												
Level 2 variance (School)												
Intercept	.05	.04	.14	.07	.14	.06	.13	.06	.06	.07	.17	.09
Level 1 variance (Teacher)												
Residual	.24	.04	.32	.07	.20	.05	.25	.06	.43	.08	.40	.09
Δ -2Loglikelihood	167.18**		187.25***		184.97***		191.49***		247.01***		221.33***	
Distribution of the total variance (based on empty models)												
School level	23%		37%		33%		32%		23%		34%	
Teacher level	77%		63%		67%		68%		77%		66%	

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>a</sup>Teaching subject was coded 0 = mathematics and natural sciences; 1 = social sciences and language.

<sup>b</sup>Class size was coded 0 = small class (10–20 students); 1 = large class (21–40 students).

<sup>c</sup>Teacher gender was coded 0 = male; 1 = female.

<sup>d</sup>School type was coded 0 = NOIDS school; 1 = OIDS school. No interaction effects between teacher gender and class size associated with teaching components were found.



**Table 3.** Multilevel models of links between teaching behaviour and student engagement (teaching model).

	Model 1 (engagement + learning climate)		Model 2 (engagement + classroom management)		Model 3 (engagement + clarity of instruction)		Model 4 (engagement + activating learning)		Model 5 (engagement + adaptive teaching)		Model 6 (engagement + teaching learning strategy)		Model 7 (full model)	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
<i>Fixed effect</i>														
Intercept	.39	.31	.72***	.21	.43	.23	1.10***	.25	1.93***	.22	1.76***	.22	.21	.25
Teaching subject <sup>a</sup>	-.08	.09	-.09	.08	-.17	.09	-.17	.10	-.13	.11	-.16	.11	-.14	.08
Class size <sup>b</sup>	-.13	.09	-.07	.08	-.02	.08	-.07	.10	-.06	.11	-.08	.11	-.03	.08
Teacher gender <sup>c</sup>	.03	.09	.06	.08	-.01	.08	.07	.09	.08	.10	.18	.10	.01	.08
School type <sup>d</sup>	.12	.10	.01	.08	.05	.09	.10	.09	.09	.11	.06	.11	.02	.08
Learning climate	.81***	.09											.14	.10
Classroom management			.78***	.06									.43***	.11
Clarity of instruction					.90***	.07							.51***	.15
Activating learning							.70***	.07					-.18	.13
Adaptive teaching									.49***	.07			.04	.08
Teaching learning strategy											.50***	.07	.02	.09
<i>Random effects</i>														
Level 2 variance (school)														
Intercept	.14	.06	.05	.04	.02	.03	.00	.00	.03	.05	.07	.06	.05	.04
Level 1 variance (teacher)														
Residual	.21	.05	.21	.04	.24	.04	.35	.04	.39	.06	.33	.07	.18	.04
Deviance	279.57		235.88		238.13		283.47		313.01		299.33		212.28	
Total variance explained (based on empty model)	School level		22%											
	Teacher level		88%											

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

<sup>a</sup>Teaching subject was coded 0 = mathematics and natural sciences; 1 = social sciences and language.

<sup>b</sup>Class size was coded 0 = small class (10–20 students); 1 = large class (21–40 students).

<sup>c</sup>Teacher gender was coded 0 = male; 1 = female.

<sup>d</sup>School type was coded 0 = NOIDS school; 1 = OIDS school.

behaviour and differences between teachers in the domains of teaching behaviour are partly related to differences between (the teachers of different) schools.

We found no significant differences with respect to teaching behaviour of pre-service teachers associated with school type and teaching subject. However, class size and teacher gender explain differences in several domains of teaching behaviour. In particular, class size could explain differences in all domains of teaching behaviour except learning climate. Results suggest that the quality of classroom management ( $\beta = -.23, p < .05$ ), clear instruction ( $\beta = -.26, p < .01$ ), activating learning ( $\beta = -.26, p < .01$ ), adaptation ( $\beta = -.36, p < .01$ ) and teaching strategies ( $\beta = -.35, p < .01$ ) of pre-service teachers teaching in small classes are better than their colleagues teaching in larger classes. Effects of teacher gender are also visible, but to a smaller degree compared to class size effects. Results reveal that only differences in learning climate ( $\beta = .16, p < .05$ ) and clear instruction ( $\beta = .18, p < .05$ ) could be explained by teacher gender, revealing that female pre-service teachers display better quality of learning climate and clarity of instruction than male pre-service teachers.

### ***Effective teaching behaviour and pupils' academic engagement***

Results of multilevel analyses reveal that significant links between teaching behaviour and pupils' academic engagement are evident (see Table 3). All domains of teaching behaviour could explain differences in pupils' academic engagement. About 50% of the total variance in pupil engagement can be explained by differences in teaching behaviour.<sup>3</sup> All teaching domains together explain approximately 27% variance at school level and 56% variance at teacher level. However, not all domains of teaching behaviour have significant unique effects on pupil engagement. Classroom management and clarity of instruction have significant unique effects and appear to be the two most significant predictors of pupil engagement. Learning climate, activating learning, teaching strategy and adaptation, respectively, are important predictors as well, but their effects are smaller than the effects of classroom management and clarity of instruction. Taken together, results suggest that all domains of teaching behaviour are important for supporting pupils' academic engagement.

## **Discussion**

The present study examined the general level of effective teaching behaviour of pre-service teachers teaching in secondary education. Furthermore, the role of several contextual and personal characteristics in explaining differences in effective teaching behaviour and the link between effective teaching behaviour and pupils' academic engagement were investigated. Findings of our study discussed below show substantiate differences in the level of effective teaching behaviour between pre-service and experienced teachers; several contextual and personal characteristics were shown to determine differences in effective teaching behaviour, and the importance of effective pre-service teaching behaviour for pupil engagement was established.

To begin with, we found that pre-service teachers generally show better performance in more basic teaching domains including creating safe and stimulating learning climates, maintaining classroom management and ensuring clarity of instruction compared to more complex teaching domains like activating pupil learning, adapting teaching to the needs of individual pupils and teaching learning strategies to pupils. When comparing these findings

to the previous research of experienced teachers (Van de Grift, 2007; Van de Grift, 2010), we found that for all teaching domains, the general level of effective teaching behaviour of pre-service teachers is below that of experienced teachers. Therefore, this finding is consistent with our first hypothesis.

Furthermore, our expectation that several contextual and personal characteristics could explain differences in teaching behaviour was partly confirmed. There is evidence that class size and teacher gender explain differences in effective teaching behaviour. However, we found no indications of effects of school preparation route and teaching subject on effective teaching behaviour. The lack of evidence of the impact of school preparation route might be due to the measurement moment halfway the school year. This might have been too early to capture this intended contextual effect. Future longitudinal research might reveal true impact. Class size was found to be more predictive of effective teaching behaviour than teacher gender: class size could explain differences in five domains of effective teaching behaviour, while teacher gender could merely explain differences in two domains. Consistent with previous studies (Bennett, 1996; Blatchford et al., 2002, 2011; Brühwiler & Blatchford, 2011), we found that the quality of effective teaching behaviour in small classes is better compared to large classes. This is true regarding classroom management, clarity of instruction, activation of learning, adaptation of teaching and teaching strategies. Class size had no significant effect on the quality of pre-service teachers' learning climate, although tendency is visible (close to the 10% significant level). This implies that teacher education should pay attention to different teaching methods that are effective for teaching smaller or larger groups of pupils.

Consistent with past research (Martin & Yin, 1997; Van de Grift et al., 2011), we also found that female teachers revealed more effective behaviour than male teachers with respect to the quality of learning climate and clarity of instruction. Other studies indicated that female teachers are generally seen as stricter or less cooperative compared to male teachers with regard to the interpersonal relationship with their pupils (Maulana et al., 2013; Opdenakker et al., 2012; Van Petegem et al., 2005). Because our conceptualisation of learning climate includes the concept of teacher cooperativeness to pupils, our finding suggests that female teachers might be seen as stricter, but they are more able to maintain safe and stimulating learning climates generally than male teachers. Because past research included experienced teachers in the sample, another line of reasoning might be that this finding is unique for pre-service teachers only. Additionally, past research discovered that differences in the instructional clarity between male and female teachers are indiscernible (Opdenakker & Maulana, 2010). However, we lack evidence with regard to the effect of teacher gender on the clarity of instruction. Hence, research finding on this area remains inconclusive. The practical implication of gender effects should be studied more extensively focusing on gender-specific differentiation during teacher education.

Finally, consistent with our third hypothesis, we found that effective teaching behaviour was linked with pupils' academic engagement. The significant relation to pupil engagement was evident for all six teaching domains. This finding signifies empirical evidence that teachers play an important role in the academic engagement of pupils already from the pre-service teaching context. Hence, the finding is in agreement with findings from more

experienced teachers (Davidson et al., 2010; Maulana et al., 2012; Opdenakker et al., 2012; Wentzel, 1997). These confirmations add to the validity of our proposed model.

The present study informs us which domains of effective teaching behaviour are more important than the others. Remarkably, classroom management and clarity of instruction had significant unique effects and appear to be the two most significant predictors of pupil engagement. This finding is in line with another research with experienced teachers (Maulana et al., 2012). This delivers evidence that these two teaching domains are central to pupil engagement. For pre-service teachers, classroom management and clarity of instruction are major issues in their teaching. This is not surprising because they still lack experiences in managing classroom organisation and instructional clarity. During the beginning phase of teaching, teachers typically encounter problems with classroom organisation and instructional clarity and, subsequently, they typically devote more efforts to the mastery of these two teaching skills. Nevertheless, there is evidence that Learning climate, activating learning, adaptation and teaching strategies are important for pupil engagement as well. Overall, results suggest that when (pre-service) teachers display better effective teaching behaviour, the more pupils' academic engagement is achieved.

### ***Limitations and future perspectives***

Although this study has strengths in providing evidence with respect to effective teaching behaviour and pupil engagement from the pre-service teacher context, this research has some limitations. It is plausible that observer ratings on effective teaching behaviour are dependent on observer gender. Hence, the relationship between the gender of the observer and the gender of the teacher being observed needs to be investigated in the future to justify valid conclusions. Second, teachers in smaller classes reveal higher behavioural ratings. The interaction with gender should be studied to shed more light on this finding. Third, school preparation route does not seem to influence behavioural ratings. The schooling route effect might not be visible during the educational period but might emerge in a later stage of the career. Future research will benefit from a longitudinal study tracking the effective teaching behaviour trajectory in different schooling routes to justify this assumption and testing bidirectional relation between teaching behaviour and academic engagement. Additionally, it is worthwhile to validate our findings with pupil and teacher self-perceptions about effective teaching behaviour. Knowing that effective teaching behaviour has effects on pupil engagement, while the level of teaching behaviour of pre-service teachers is lower than experienced teachers, teacher education programmes should prepare student-teachers via interventions targeting at the zone of proximal development that can accelerate the improvement of effective teaching behaviour.

### ***Implication for research and practice***

Drawing from the finding of this study that pupils' academic engagement is influenced by (pre-service) teaching behaviour, in combination with other studies emphasising the importance of academic engagement for pupils' academic achievement, it becomes important that pre-service teachers need to learn effectively to improve the quality of their teaching behaviour in order to accelerate the development of teaching skills. This can be done during teacher education and by setting up and evaluating interventions targeted to the zone

of proximal development of pre-service teachers by means of, for instance, induction arrangements for beginning teachers. The results of this study can lead to setting realistic standards for teacher licensing. Our results reveal that most pre-service teachers are sufficiently capable of most of the measured behaviours. A realistic standard would be that the sufficient level should be reached for all the more basic teaching domains including creating safe and stimulating learning climates, maintaining classroom management, displaying clarity of instruction and activating pupil learning by pre-service teachers upon the completion of teacher training. From the start of entering teaching profession, certified teachers should be supported further to maintain and improve their basic teaching skills and guide them to start paying more attention to the more complex teaching skills (i.e. adaptation and teaching learning strategy). This can be done through a professional teacher development programme for beginning teachers such as induction programmes, which have been proven to be effective to improve beginning teachers' teaching skills (Helms-Lorenz & Maulana, 2016; Helms-Lorenz, Van de Grift, & Maulana, 2016). Future work should be directed towards finding effective ways to support beginning teachers to accelerate the mastery of effective teaching behaviour so that they could reach the quality level of experienced teachers faster.

## Notes

1. The classification of schools into OIDS ('opleiden in de school') and NOIDS ('niet opleiden in de school' or a more traditional form of teacher preparation route) is based on the results of a joint Dutch/Flemish commission that evaluates the quality of school- and educational-institute partnerships (2001). OIDS schools are subsidised for their contribution to teacher education and are more responsible for the preparation of student-teachers compared to NOIDS schools.
2. OIDS is a Dutch acronym for Opleiding in de School (school-based route). OIDS is a longitudinal project that was designed to track various cohorts of pre-service teachers between the 2010 and 2014 academic year in the Netherlands.
3. The calculation of the percentages of explained variance was based on the multilevel teaching model and the empty model (without the inclusion of background variables). Learning climate explains 32% of the variance, classroom management 48%, clear instruction 42%, activating learning 32%, adaptation 21% and teaching strategy 23%.

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## Appendix

Example of a dimension and the corresponding items of observation instrument.

Dimension	High-inference indicator		Low-inference indicator	
	The teacher ...	Rating	The teacher ...	
Creating safe and stimulating classroom environment	Shows respect for the pupils in behaviour and language use	1 2 3 4	Allows pupils to finish speaking	
			Listens to what pupils have to say	
			Makes no role-confirming remarks	
	Ensures a relaxed atmosphere	1 2 3 4	Addresses the children in a positive manner	
			Reacts with humour and stimulates humour	
			Allows children to make mistakes	
	Supports the self-confidence of pupils	1 2 3 4	Demonstrates warmth and empathy towards all pupils	
			Feeds back on questions and answers from pupils in a positive way	
			Pays pupils compliments on their results	
	Promotes mutual respect and interest of pupils	1 2 3 4	Honours the contributions made by children	
			Encourages children to listen to each other	
			Intervenes when children are being laughed at	
			Takes (cultural) differences and idiosyncrasies into account	
			Ensures solidarity between pupils	
			Ensures that events are experienced as group events	

Note. Rating is defined as: 1 = mostly weak, 2 = more often weak than strong, 3 = more often strong than weak or 4 = mostly strong.